

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

PIPELINE

(Feet)

CODE 516

DEFINITION

Pipeline having an inside diameter of 8 inches or less.

PURPOSE

To convey water from a source of supply to points of use for livestock, wildlife, or recreation.

CONDITIONS WHERE PRACTICE APPLIES

Where it is desirable or necessary to convey water in a closed conduit from one point to another.

CRITERIA

Capacity. For livestock water, the installation shall have a capacity to provide seasonal high daily water requirements for the number and species of animals to be supplied. [The system shall provide at least:](#)

Dairy Cattle	25 Gallons per Day per Cow
Beef Cattle	20 Gallons per Day per Cow
Horses	12 Gallons per Day per Horse
Sheep	3 Gallons per Day per Sheep
Goats	3 Gallons per Day per Goat

For recreation areas, the water capacity shall be adequate for all planned uses. Typical examples are drinking water, fire protection, showers, flush toilets, and irrigation of landscaped areas.

Additional water capacity will be provided for wildlife when applicable.

Sanitary Protection. If water from the pipeline is to be used for human consumption, applicable state and local regulations shall be met.

Pipe. All pipe must withstand the pressure it will be subjected to, including hydraulic transients, internal pressures and external pressures. As a safety factor against surge or water hammer, the working pressure should not exceed 72% of the pressure rating of the pipe and the design flow velocity at system capacity should not exceed 5 ft/sec. If either of these limits is exceeded, special consideration must be given to flow conditions and measures must be taken to adequately protect the pipeline against surge.

Steel pipe shall meet the requirements of AWWA Specification C-200.

Plastic pipe shall conform to the requirements of the following ASTM specifications, as applicable:

D 1527 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80

D 1785 Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120

D 2104 Polyethylene (PE) Plastic Pipe, Schedule 40

D 2239 Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter

D 2241 Poly(Vinyl Chloride) (PVC), Pressure-Rated Pipe (SDR)

D 2282 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe (SDR-PR)

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

D 2447 Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter

D 2513 Thermoplastic Gas Pressure Pipe, Tubing and Fittings

D 2737 Polyethylene (PE) Plastic Tubing

D 2672 Joints for IPS PVC Using Solvent Cement

D 3035 Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter

AWWA C900 Polyvinyl Chloride (PVC) Pressure Pipe, 4 inches through 12 inches

AWWA C901 Polyethylene (PE) Pressure Pipe and Tubing, ½ inch through 3 inches

Plastic pressure pipe fittings shall conform to the following ASTM specifications, as applicable:

D 2464 Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

D 2466 Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40

D 2467 Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

D 2468 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe Fittings, Schedule 40

D 2609 Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe

D 2683 Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing

D 3139 Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

D 3261 Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing

Solvents for solvent-welded plastic pipe joints shall conform to the following ASTM specifications, as applicable:

D 2235 Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings

D 2564 Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings

D 2855 Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings

Rubber gaskets for pipe joints shall conform to the requirements of ASTM F477, Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

Drainage. Valves or unions shall be installed at low points in the pipeline so that the line can be drained as needed. Check valves shall be installed as needed to protect groundwater quality or maintain a full pipeline.

Vents. Design shall provide for entry and removal of air along the pipeline, as needed, to prevent air locking or pipe collapse. If parts of the line are above the hydraulic gradient, periodic use of an air pump may be required. Provisions shall be made for pressure relief, air relief and vacuum relief as needed to protect the pipeline.

Joints. Watertight joints that have a strength equal to that of the pipe shall be used. Couplings must be of material compatible with that of the pipe. If they are made of material susceptible to corrosion, provisions must be made to protect them.

Protection. When steel pipe is used, interior protective coatings shall be provided in accordance with NRCS Conservation Practice Standard 430FF, Steel Pipe. If a coal-tar enamel protective coating is needed for corrosion protection, the coating shall meet the requirements of AWWA Specification C-203.

Steel pipe installed above ground shall be galvanized or shall be protected with a suitable protective paint coating, including a primer coat and two or more final coats.

Plastic pipe installed above ground shall be resistant to ultraviolet light throughout the intended life of the pipe.

All pipes shall be protected from hazards presented by traffic, farm operations, freezing temperatures, fire, thermal expansion and contraction. Reasonable measures should be taken to protect the pipe from potential vandalism.

Vegetation. Disturbed areas shall be established with vegetation or otherwise stabilized as soon as practical after construction. Seedbed preparation, seeding, fertilizing, and mulching shall be in accordance to Vermont Construction Specification 52 – Seeding.

Visual Resources. The visual design of pipelines and appurtenances in areas of high public visibility shall be carefully considered.

Pipe Inlet and Outlet. The inlet of the pipe shall be protected by the installation of a tee and vent pipe, screen or sediment trap. The pipeline shall discharge into an approved watering facility. Livestock watering facilities shall be in accordance with standard 614 – Watering Facility.

Placement. Pipeline shall be placed so it is protected against hazards imposed by traffic, farm operations, freezing temperatures or soil cracking. Other means of protection must be provided where the depth required for protection is not possible due to shallow soils over bedrock or other reasons.

Backfill for trenches for plastic pipelines shall be free of rocks and other sharp edge materials and the pipe shall be carefully placed to prevent damage. Plastic pipelines may be placed by plow-in equipment if soils are suitable and rocks and boulders will not damage the pipe. Abrupt changes in grade must be avoided to prevent rupture of the pipe.

Testing. Pipelines shall be pressure tested by one of the following methods:

1. Before backfilling, fill the pipe with water and test at the design working head or head of ten feet, which ever is greater. All leaks must be repaired, and the test must be repeated before backfilling.
2. Pressure test at the working pressure for two hours. The allowable leakage shall not be greater than one gallon per diameter inch per mile. If the leakage exceeds this rate, the defect must be repaired until retest shows that the leakage is within the allowable limits. All visible leaks must be repaired.

Backfilling. All backfilling shall be completed before the line is placed in service. For plastic or copper pipe, the initial backfill shall be of selected material, free from rocks or other sharp-edged material that would damage the pipe. This initial fill shall be compacted around the pipe to a density that is close to the natural density of the trench sidewalls. Deformation or displacement of pipe shall not occur during backfilling. Plastic pipelines installed by plow-in equipment require surface compaction and shaping in addition to normal plow-in operations. Provisions for stabilization of disturbed areas and control of erosion during construction shall be installed as necessary.

CONSIDERATIONS

No special considerations have been identified for this practice.

PLANS AND SPECIFICATIONS

Plans and specifications for installing pipelines shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. If the pipeline is a component of a system that includes additional conservation practices, the information necessary to construct these additional practices will also be conveyed on the plans.

The Engineering Field Handbook, Chapter 5, will guide the development of plans.

OPERATION AND MAINTENANCE

An O&M plan specific to the type of installed pipeline and other associated practices shall be provided to the landowner. The owner shall sign the O&M plan to indicate an understanding of the requirements and a commitment to operate and maintain the system as specified. The plan shall include, but not be limited to, the following provisions:

- Opening/closing valves to prevent excessive water hammer;
- Filling at the specified rate requirements;
- Inspecting and testing valves, pressure regulators, pumps, switches and other appurtenances;
- Maintaining erosion protection at outlets;
- Checking for debris, minerals, algae and other materials which may restrict system flow; and
- Draining and/or providing for cold weather operation of the system.
- All valves and other appurtenances shall be protected from livestock access.
- Pipelines install on top of the ground shall be adequately drained to prevent damage by ice and freezing during the winter.

REFERENCES

Engineering Field Handbook